

to try and interest the students in the scientific origins of these stories.

The current pressures for early clinical exposure and more relevance are reactions against the excesses of the Flexnerian revolution. However, there is a danger that this reaction with its understandable wish to harness the vocational drive of the students may limit the demands they make of science and scientists. There is a little-used word which nicely expresses what I fear—banalistic, "suitable for a mere mechanic; illiberal".¹ Unless science is more fairly treated, the reaction may have the unfortunate effect of weakening the scientific influence in medicine because of a false association of science with technology and a false antithesis between science and humanity. There is a danger that rather than putting right the undesirable consequences of the Flexnerian revolution we shall return to the pre-Flexnerian era. There may be a change in that knowledge of the stories of the more groovy sciences such as molecular biology may be required instead of the stuffy old ones such as anatomy, but that may be all.

Special effort to promote the interest of students in science is needed in face of the demand for clinical relevance. I believe the best hope lies not in a return to the traditional methods of instruction in basic science courses but in the personal example of the scientists both "basic" and "clinical" who should insist that an appreciation of science must be an objective for all students. There are many ways in which this objective may be achieved; but I am sure that, just as it is essential for the students to meet doctors behaving as doctors, so it is essential for them to meet scientists behaving as scientists. The student and the scientist must be brought together for a grander purpose than the passive transfer of acceptable stories.

SO WHAT?

One does not have to be a renegade or a Luddite to admit that people such as Illich⁹ have some grounds for criticising the overenthusiastic application of technology in medicine. Those who side with such critics may well attribute any such shortcomings of the medical profession to too much scientific education and there is definitely an antiscientific ring to many of the voices arguing for reform in medical education. I believe that these criticisms are mistaken and that the hope of progress lies not in an attack on the dominant role of science in medical education but a recognition that it is too weak.

I am grateful to many people at McMaster and elsewhere for their criticisms and suggestions. The essay was finally written while I was a Josiah Macy, Jr. Foundation Faculty Scholar, 1975–76, at the Royal Postgraduate Medical School, London.

REFERENCES

1. Popper, K. R. *The Logic of Scientific Discovery*. New York, 1959.
2. Popper, K. R. *Conjectures and Refutations: The Growth of Scientific Knowledge*. London, 1962.
3. Magee, B. Popper. London, 1973.
4. Medawar, P. B. *The Art of the Soluble*. London, 1967.
5. Medawar, P. B. *Induction and Intuition in Scientific Thought*. London, 1969.
6. Medawar, P. B. *Is the Scientific Paper a Fraud? in Experiment: A Series of Scientific Case Histories first Broadcast in the B.B.C. Third Programme*. (edited by David Edge). London, 1964.
7. Popper, K. R. *Objective Knowledge: An Evolutionary Approach*. London, 1972.
8. *Concise Oxford Dictionary of Current English* (edited by Henry Watson and F. G. Watson). London, 1929.
9. Illich, I. *Medical Nemesis*. London, 1975.

Occasional Survey

MORTALITY FROM LUNG CANCER AND CORONARY HEART-DISEASE IN RELATION TO CHANGES IN SMOKING HABITS*

NICHOLAS J. WALD

*D.H.S.S. Cancer Epidemiology and Clinical Trials Unit,
Department of the Regius Professor of Medicine, Radcliffe
Infirmary, Oxford OX2 6HE*

Summary Changes in the type and quantity of cigarettes smoked in the United Kingdom from 1956 to 1971 are compared with changes in the death-rates due to lung cancer and coronary heart-disease (C.H.D.) from 1956 to 1973. Associated with a change to filter cigarettes there has been a decrease in lung-cancer mortality among men aged less than sixty years despite little change in the number of cigarettes smoked. In contrast, lung-cancer mortality has increased in women along with their cigarette consumption. C.H.D. mortality has continued to increase in both sexes, but to a greater extent in women. These changes are consistent with the hypothesis that, in tobacco smoke, tar is the principal aetiological factor in lung cancer, whereas carbon monoxide or other gaseous constituents are involved in the development of C.H.D.

INTRODUCTION

MORTALITY from lung cancer and coronary heart-disease (C.H.D.) is associated with cigarette smoking.¹⁻³ I have examined changes in mortality from these diseases in relation to altered patterns of cigarette smoking in the United Kingdom, and attempt to interpret the changes in mortality recorded.

METHODS

The total annual consumption of manufactured plain and filter-tipped cigarettes in the U.K. from 1920–71 was obtained

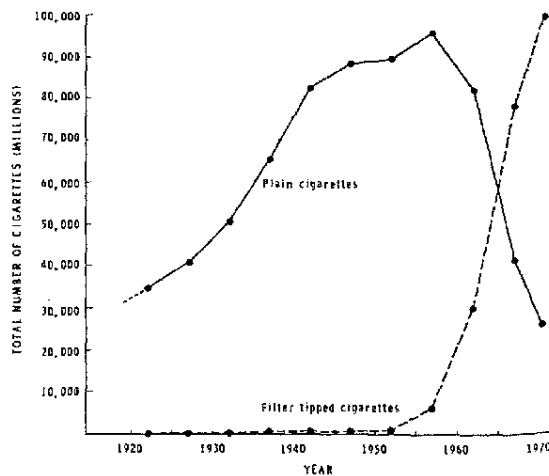


Fig. 1—Annual consumption of manufactured plain and filter cigarettes in the U.K.

*Presented in part at the annual meeting of the Society of Occupational Medicine, September, 1974, and at the 3rd World Conference on Smoking and Health, New York, 1975.

2063631174

from Todd
manufacture
U.K. from
related to t
years and
each point
periods, ex
1970 and 1

The CO
cigarette we
yields of the
by the Dep
'Capstan Fi
'1', 'Embas
Plain', 'Pic
bine Plain',
Menthol',
'John Player
King Size',
'Senior Serv

The chan
162–3) in F
women in fi
between 19
quinquennia
figures.⁶ Th
in England
lated, using
codes 410–4
altered by in
in the rates c

Fig. 1 sh
erable chan
ter-tipped v
a substantia
per cigarette
but in 197
average, 40
was about 2
and tar yiel
tries such as

With the
weight of t
quantity sm
much becau

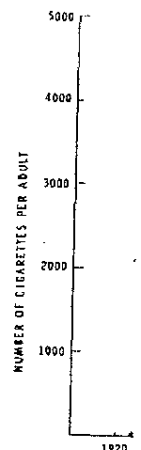


Fig. 2—Annual consumption of manufactured cigarettes in the U.K.

from Todd* (fig. 1). The mean annual consumption of all manufactured cigarettes per adult for men and women in the U.K. from 1920-71 is shown in fig. 2. Consumption has been related to the total population of each sex aged over fourteen years and not to the population of smokers. In both figures each point on the graph is the average for consecutive five-year periods, except for the last point which is the average value for 1970 and 1971.

The CO yields of nine plain and nine filter-tipped brands of cigarette were measured on a smoking machine.³ The nicotine yields of the same brands were obtained from tables published by the Department of Health. The nine plain brands were: 'Capstan Full Strength', 'Capstan Medium', 'Churchmans No. 1', 'Embassy Plain', 'Gauloises Caporal Plain', 'Kensitas Plain', 'Piccadilly No. 1', 'Senior Service Plain', and 'Woodbine Plain'. The nine filter-tipped brands were: 'Consulate Menthol', 'Dunhill International', 'Gitanes Caporal Filter', 'John Player Special', 'Peter Stuyvesant King Size', 'Piccadilly King Size', 'Players No. 6 Filter', 'Rothmans King Size Filter', 'Senior Service Tipped'.

The changes in death-rate due to lung cancer (I.C.D. codes 162-3) in England and Wales were calculated for men and women in five-year age-groups (from thirty to sixty-nine years) between 1956-60 and 1969-73, the latter being the latest quinquennium for which the Registrar General has published figures.⁶ The corresponding changes in death-rate from C.H.D. in England and Wales over the same period were also calculated, using I.C.D. codes 420 and 422.1 until 1967 and I.C.D. codes 410-414 thereafter. The results were not materially altered by including deaths classified under I.C.D. code 422.2 in the rates calculated for the period before 1968.

RESULTS AND DISCUSSION

Fig. 1 shows that since 1955 there has been a considerable change in cigarette sales from the plain to the filter-tipped variety. Associated with this change has been a substantial fall in the average yield of tar and nicotine per cigarette. U.K. figures before 1965 are not available, but in 1973 the tar yield of U.K. cigarettes was, on average, 40% less than in 1965, and the nicotine yield was about 33% lower.⁷ Similar changes in the nicotine and tar yields of cigarettes have occurred in other countries such as America and Germany.⁸

With the change from plain to filter cigarettes the weight of tobacco per cigarette has decreased but the quantity smoked in each type has probably not altered much because in filter cigarettes the butt consists mainly

of filter, and less tobacco is thrown away. Therefore when comparing smoking habits with mortality trends during this period of change it is better to measure cigarette consumption by number of cigarettes sold than by weight of tobacco sold. Fig. 2 shows that during the same period the number of cigarettes smoked by men had not changed greatly but consumption by women had approximately doubled.

Fig. 3 shows that the average CO yield of the filter-tipped cigarettes tested was 28% higher than that of the plain cigarettes ($p < 0.001$ Wilcoxon rank-sum test). In contrast the average nicotine yield of the filter cigarettes was lower ($p < 0.005$) than those of the plain ones (fig. 4). Smoke passing through a cigarette is diluted by air entering through the porous cigarette paper, and, since the paper surrounding the filter of tipped cigarettes is relatively non-porous, the CO content of the smoke passing through this type of cigarette is higher. Brands of filter-tipped cigarettes with special perforations in the

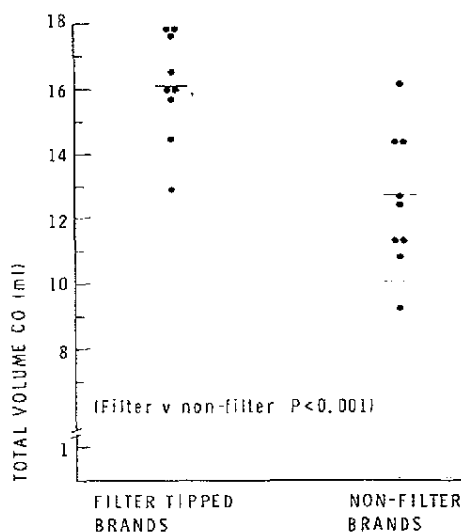


Fig. 3—CO yields of eighteen brands of cigarettes.

Each point represents the mean of 2-4 determinations.

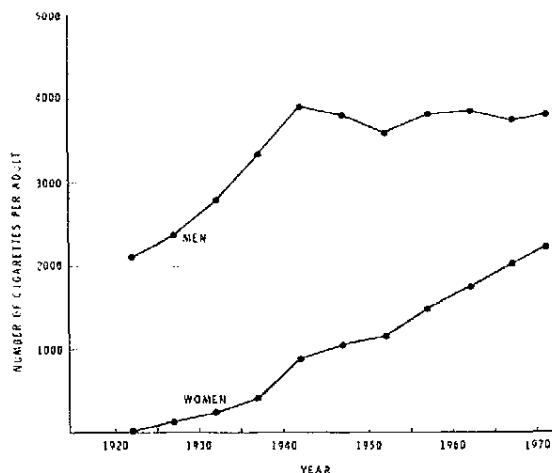


Fig. 2—Annual consumption of cigarettes per person aged over 14 years in the U.K.

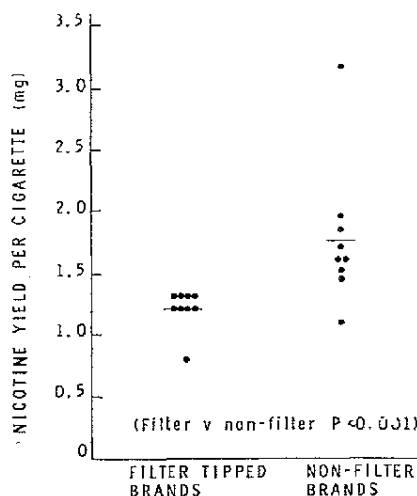


Fig. 4—Nicotine yields of the same brands of cigarettes shown in fig. 3.

2063631175

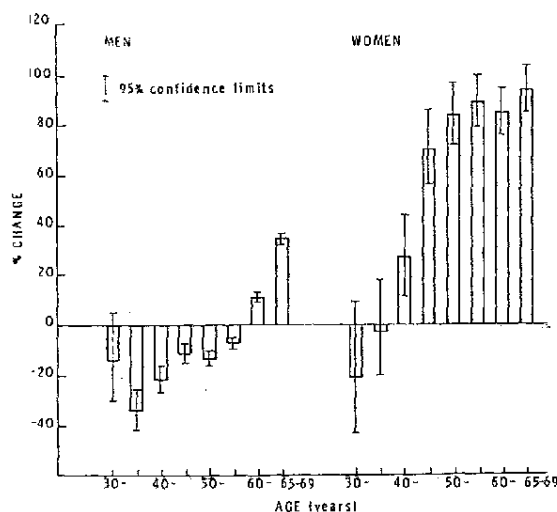


Fig. 5—Change in lung-cancer mortality in England and Wales from 1956-60 to 1969-73.

paper surrounding the tip are an exception since the smoke is diluted with air which enters through these perforations.⁹ In some cigarettes tobacco smoke has been diluted in this way by as much as 70%. Cigarettes of this type constitute less than 5% of the current U.K. market.⁵

Since 1955 lung-cancer mortality under the age of sixty in England and Wales has been falling among men but increasing among women (fig. 5). The increased mortality among women is likely to be due to their more recent adoption of the smoking habit, while the reduction in male mortality is probably explained by the reduced tar yield of cigarettes smoked in the absence of much change in their cigarette consumption. In support of this Wynder and his colleagues showed that the smoking of filter-tipped cigarettes by men for ten years or more reduced the risk of lung cancer by about a third¹⁰ compared with persons who smoked plain cigarettes.

Over the same period C.H.D. mortality in England and Wales has increased in both sexes, more so among women (fig. 6). The increased mortality among women may be partly due to other factors such as the wider use of oral contraceptives,¹¹ but in both sexes some of the increase may be related to cigarette smoking.

A reduction in C.H.D. mortality after giving up smoking seems to happen in two or three years,³ so if nicotine were the main constituent of tobacco smoke to affect C.H.D. mortality, it should be possible to detect some reduction in mortality a few years after changing to filter cigarettes. Although there has been a slight reduction in the rate of increase of C.H.D. mortality in men since 1960, this change has been small and certainly much less than the large reduction in the nicotine yield of cigarettes. On the other hand, if CO is the important factor in smoking related to the development of C.H.D., as has been suggested,¹² then mortality in men after 1960 would be expected to continue to rise, while that among women should have increased to an even greater extent. These, in fact, are the changes which have occurred. Although it is necessary to be cautious in making inferences about secular changes in national mortality figures, the increase in C.H.D. mortality among men and women is consistent with the hypothesis that a

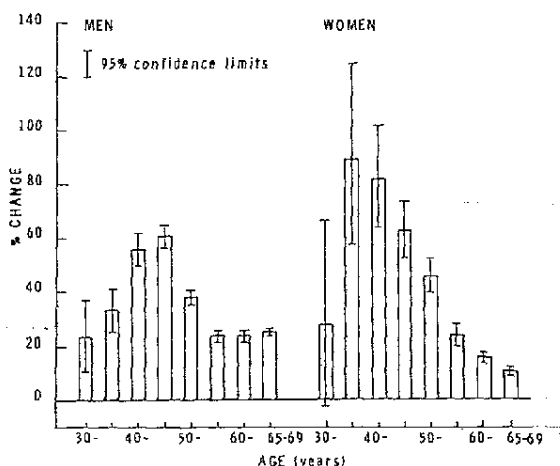


Fig. 6—Change in C.H.D. mortality in England and Wales from 1956-60 to 1969-73.

gaseous constituent of tobacco smoke, such as CO, is a cause of this disease.

The possibility that smoking filter-tipped cigarettes might be more harmful in relation to C.H.D. than smoking plain cigarettes is of considerable importance in view of the large number of filter cigarettes which are now smoked. Further epidemiological investigation is urgently required to determine if the death-rate from C.H.D. among smokers of filter-tipped cigarettes is greater than among smokers of plain cigarettes.

REFERENCES

1. Doll, R., Hill, A. B. *Br. med. J.* 1964, i, 1399, 1460.
2. Kahn, H. A. *Natn. Cancer Inst. Monogr.* 1966, 19, 1.
3. Hammond, E. C. in *Proceedings of the Second World Conference on Smoking and Health* (edited by R. G. Richardson); p. 24. London, 1972.
4. Todd, G. F. (editor) *Statistics of Smoking in the United Kingdom*. Tobacco Research Council, London, 1972.
5. Wald, N. J., Howard, S., Evans, J. *Br. med. J.* (in the press).
6. Registrar General's Statistical Reviews of England and Wales (1956-73): part 1, tables, medical. H.M. Stationery Office.
7. Todd, G. F. *Changes in Smoking Patterns in the U.K.* Tobacco Research Council, London, 1975.
8. Wynder, E. L., Hoffmann, D. J. *natn. Cancer Inst.* 1972, 48, 1749.
9. Wald, N., Smith, P. G. *Lancet*, 1973, ii, 907.
10. Wynder, E. L., Mabuchi, K., Beattie, E. J., Jr. *J. Am. med. Ass.* 1970, 213, 2221.
11. Mann, J. I., Vessey, M. P., Thorogood, M., Doll, R. *Br. med. J.* 1975, ii, 241.
12. Astrup, P. *ibid.* 1972, iv, 447.

ACUTE EYE DISEASE SECONDARY TO CONTACT-LENS WEAR

Report of a Census

MONTAGUE RUBEN

Moorfields Eye Hospital, London WC1V 7AN

Summary In a three-month survey of some hospital consultant ophthalmic services, 82 instances of complications of contact-lens wearing were reported. Some of the complications gave rise to discomfort, but in only 5 cases was vision impaired.

THE last well-documented survey of the incidence of eye disease secondary to contact-lens wear was conducted retrospectively in the U.S.A. in 1960.¹ Of a total

of 8181 cases 14 cases of vision were impaired.

The present study was conducted in Scotland, June, 1975. For each patient, three months of contact-lens wear were returned a questionnaire indicating that no contact-lens wear was that no contact-lens wear.

Patients and

The 82 patients (average age 29) with unilateral or bilateral contact-lens wear.

The types of contact-lens wear were soft (10%) and hard (90%). The contact-lens wear was worn for 3-5 years (22%) and 5-12 years (78%).

Wearing contact-lens wear for the following 3-5 years (22%) and 5-12 years (78%) under 12 hours wear by 4 patients.

Eye Lesions

Corneal lesions 18, ulcer 18, conjunctivitis 18, other lesions 18.

Thus, the total of these 13 patients.

Causes of Lesions

47 (58%) lenses and contact lens for 5 (6%). (25%) no loss in 71 case of severe due to contact-lens wear in the group 1%. Bilateral patients.

Types of Lesions

The major one-eighth of Perma (perma acrylate lens) affecting accommodation did not methods. T factor, pruned; nor able. But, soft-lens wear.

Analysis of

Among the body in the

2063631176